LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION –**PHYSICS**

FIFTH SEMESTER – **APRIL 2018**

PH 5512– ELECTRICITY AND MAGNETISM

Date: 30-04-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART-A

Answer **ALL** Questions: **(10x2=20)**

1. State Gauss divergence theorem.
2. Define electric polarization. Give its unit.
3. State Kirchoff's laws.
4. What is a thermoelectric diagram? Draw the thermoelectric line of a Cu-Pb couple.
5. A circular coil has a radius of 0.1m and number of turns of 50. Calculate the magnetic induction at a point at the centre of the coil when a current of 0.1 A flows in it.
6. State Lenz's law.
7. If the charge on a capacitor of capacitance 2μF in leaking through a high resistance of 100 megaohms is reduced to half its maximum value, calculate the time of leakage.
8. Show that $I_{mean} = \frac{2I_0}{\pi}$.
9. Define i) magnetic susceptibility and ii) magnetic permeability.
10. Define Poynting vector.

PART-B

Answer ANY **FOUR** Questions **(4X7.5=30)**

11. State Gauss law. Derive it in a dielectric medium. **(2+5.5)**
12. i) Derive Poisson's equation staring from the differential form of Gauss law. **(2.5)**

    ii) Establish a relation between electric intensity, electric polarization and electric displacement. **(3)**

    iii) Obtain the relation between dielectric constant and dielectric susceptibility. **(2)**
13. Derive an expression for the electrical conductivity of a metal using Drude-Lawrence theory and hence obtain from it ohm's law. **(5+2.5)**

14. State Ampere's circuital law and use it to calculate the magnetic field inside a long solenoid. **(2+5.5)**

15. i) What is power factor? Give the expression of the same. **(2)**

ii) An alternating voltage of 10 volts at 100 Hz is applied to a choke of inductance 5 henry and of resistance 200 ohms. Find the power factor of the coil and the power absorbed. **(5.5)**

16. A plane electromagnetic wave is incident normally at the boundary of two non conducting media. Discuss the phenomenon of reflection and refraction.

PART–C

Answer **ANY FOUR**Questions : **(4x12.5 = 50)**

17. What is an electric dipole? Derive an expression for the potential and field at any point due to a dipole. **(2+10.5)**

18. Explain with necessary theory how a Carey Foster bridge may be used to compare two nearly equal resistances. Hence show how the specific resistance of the material of the wire can be determined. **(10 + 2.5)**

19. Applyingthermodynamical consideration to the working of thermo-couple, obtain the relation between Peltier and Thompson's coefficients.

20. Explain the principle and construction of a moving coil ballistic galvanometer. Derive an expression relating the quantity of charge flowing through it and the throw obtained. Show how to correct the observed throw for damping. **(5.5+4+3)**

21. Obtain an expression for the growth and decay of charge in a capacitor through a resistance.

22. i) Give an account of Langevin's theory of diamagnetism. **(6.5)**

ii) What is meant by a) Hysteresis b) Retentivity and c) Coercivity. **(2+2+2)**

****